Title: Spin To Win

Brief Overview:

In this performance based assessment, students will explore probability in an authentic situation involving the design of a new game. Students will design a spinner and a game board, and write a business letter evaluating the fairness of the game.

Links to NCTM 2000 Standards:

- **Standard 3: Geometry and Spatial Sense**
  Mathematics instructional programs should include attention to geometry and spatial sense so that all students use visualization and spatial reasoning to solve problems both within and outside mathematics.

- **Standard 4: Measurement**
  Mathematics instructional programs should include attention to measurement so that all students apply a variety of techniques, tools, and formulas for determining measurement.

- **Standard 5: Data Analysis, Statistics, and Probability**
  Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students pose questions and collect, organize, and represent data to answer those questions; interpret data using methods of exploratory data analysis; develop and evaluate inferences, predictions, and arguments that are based on data; and understand and apply basic notions of chance and probability.

- **Standard 6: Problem Solving**
  Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems; develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics; apply a wide variety of strategies to solve problems and adapt the strategies to new situations; and monitor and reflect on their mathematical thinking and solving problems.

- **Standard 8: Communication**
  Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematics as a precise means of mathematical expression.

Grade/Level:

Grades 4-5

Duration/Length:

Three to four days. Time may vary.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Concepts of probability
- Calculating percentages
- Finding perimeter
- Measuring to the nearest inch
- Measuring with a compass

Student Outcomes:

Students will:

- work in cooperative groups as pairs.
- communicate the concept of probability.
- make individual predictions by observing spinners.
- write and explain directions for constructing a game.
- write to express an opinion.
- use perimeter to design the spaces for a game board.
- use probability to design a spinner that shows fairness and unfairness depending on the desired outcomes.
- create a bar graph to show the spinner results during the play of the game.

Materials/Resources/Printed Materials:

- Student Resource Packet, Pages One-Six
- Crayons (red, blue, yellow, green, and orange)
- 50 x 50-inch paper for each group
- Multiple pieces of red, blue, yellow, green, and orange paper cut in 2 x 2-inch squares
- Compass to create a circle
- Paper clip and pencil per group
- Jumanji, Houghton Mifflin Anthology, fifth grade

Development/Procedures:

Day 1

- Read the anthology story, Jumanji, to the class. Discuss the story elements and relate it to elements of probability.
- Distribute Student Resource Packet to each student. Have students look at Student Resource Sheet 1.
- Review the following vocabulary words with students: event, likely, not likely, equally likely, and possible. Have students reread directions and highlight key words as needed.
- Have students turn to Student Resource Sheet 2. This page gives directions to the students so that they can design their spinner. Reread directions with students and highlight key words where needed. Teacher may choose to have students write only the steps to summarize and model one color of the spinner for students.

Day 2

- Review with students the previous day's activities and vocabulary. Students can participate in a Gallery Walk, which is an activity where students walk from group to group to view other students' spinners.

You may wish to have students share spinners with the entire class. The children should be able to compare/contrast spinners and then predict the results of the spinners based on its design. This is a time where they can evaluate the spinners to see if they allowed for advancement of play and that likely, not likely, and equally likely events are represented.

- Turn to Student Resource Sheet 3. Read directions to students. Have students summarize their responsibilities.
- Students will create the game board using 2"x 2" colored paper which correlates to the spinner colors.

Day 3

- Review with students the previous day's activities and vocabulary. Ask for questions.
- Students will play the game with their partner. During this time the teacher has the opportunity to write anecdotal records for assessment and observe student work.
- Turn to Student Resource Sheet 4 which directs students to write a business letter to the president of the company stating their opinion as to the fairness of the game. Use the rubric provided for scoring of this assessment (Student Resource 5).

Performance Assessment:

The assessment for this activity will be ongoing. Students will be assessed on participation, completion of daily resource sheets, ability to work in a cooperative group, and completion of the "Writing to Inform" letter on Day 3. A rubric is provided for scoring the final writing prompt (Student Resource 5).

Extension/Follow Up:

- Students will play the spinner game at home and graph their results using a bar graph (Student Resource 6A).
- Students should analyze their graph and write four statements to reflect their graph (Student Resource 6B).

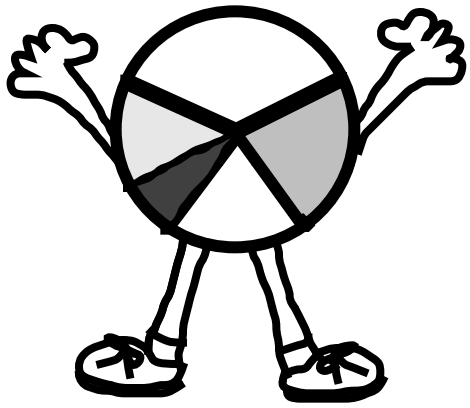
Authors:

Penny Lippman
Fort Garrison Elementary
Baltimore County, MD

Mary Sneed
Northwood Elementary
Baltimore City, MD

Spin to Win

A Game of Fun



The president of Fun-Time Toy Company, one of the world's largest toy manufacturers, has asked for your help in creating a new game. You will create the spinner, which will tell the players how many spaces they can move each turn. You will design a game board the players will use. After playing the game, you will evaluate its fairness.

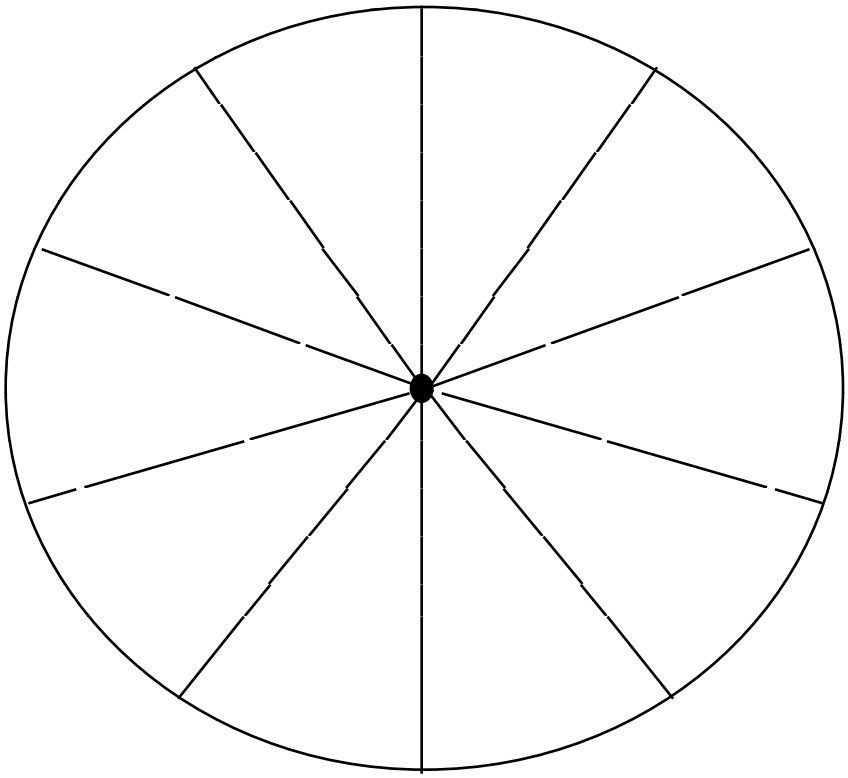
Name_____ Date_____

Designing the Game Spinner

Directions: You will create a spinner made of five colors. The colors are red, blue, yellow, green, and orange. Each color will tell players how to move:

red	**move ahead one space**
blue	**move ahead one space and spin again**
yellow	**move ahead two spaces**
green	**move back one space**
orange	**lose a turn**

HINT: Make sure the likelihood of each event is in favor of the game having movement so that there will be a winner. You might want to create events that are likely, less likely, or equally likely to occur. You must include all five of the possible events on your spinner.



Day Two: Designing the Game Board

Part I: The Spaces

Using your knowledge of percentages, you will find the numbers of spaces for each color to be placed on your game board.

A. On a paper that is 50 x 50 inches, how many 2-inch squares would be on one side?

_____

B. What is the perimeter of this four-sided board?

_____

C. Use the ten sections of your spinner to help you decide how many spaces you will need for each color.

Example:

color	# of spinner spaces	# of squares of paper
red	3	30
orange	1	10

Your results:

color	# of spinner spaces	# of squares of paper
red		
blue		
yellow		
green		
orange		

Part Two: The Spinner

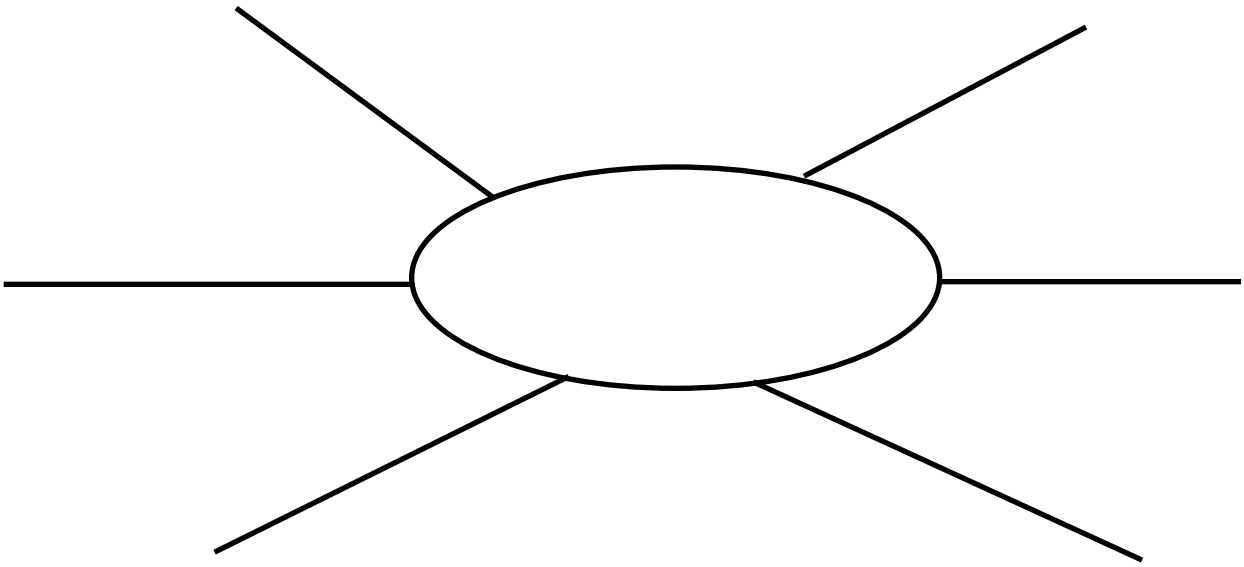
Using the compass, create a spinner with a radius of 5 inches. Divide your circle equally into 10 spaces and recreate your spinner from Student Resource Sheet 2.

Part Three: The Game

You and your partner have worked very hard to create this game. You may celebrate your work by playing your game.

The President of Fun-Time Toy Company is anxious to hear from you concerning the results of your spinner and game board creation. You decide to write him a business letter stating why you think this is a fair game that people will like. You want to be clear so you decide to include four reasons to support your opinion. Make sure to explain your reasons using your experience from playing "Spin to Win".

Use the web below to prewrite your ideas.



Student Resource Sheet 4B

Business Letter

Writing to Inform
Scoring Rubric Guide
Spin to Win

4 Point Response

- Topic sentence and supporting details
- Makes sense and is in good order
- Accurate and specific information in writer's own words
- Maximum information supported by a resource
- Vocabulary related to the topic
- Correct form
- Attention to audience

3 Point Response

- Topic sentence and supporting details
- Makes sense and is in good order
- Accurate information in writer's own words
- Adequate information supplied by a resource
- Vocabulary related to the topic
- Correct form
- Attention to audience

2 Point Response

- Topic sentence or supporting details
- Lacks good order
- Little or incorrect information in writer's own words
- Adequate information supplied by a resource
- Little or no vocabulary
- Correct form or audience

1 Point Response

- Incorrect information
- No evidence of resource or was copied from the resource

0 Point Response

- No attempt made to complete task

Extension Activity

Spin to Win

Directions: Choose one of the two tasks below to complete as a home assignment.

Task One

Play the Spin to Win game at home. Spin the spinner 30 times. Record the results on the tally sheet below. Include the colors red, blue, yellow, green, and orange on your bar graph. Graph the results of your investigation on Student Resource Page 6B. Make sure you include the appropriate elements on your graph. Then write four statements to reflect the results of your investigation.

Task Two

You have successfully created a spinner and game board for Spin to Win. Your task now is to write the directions you followed to create the spinner and game board. Be sure to provide concise and explicit directions. Write your game and spinner directions on 8 1/2 by 11-inch lined paper or on the back of this worksheet.

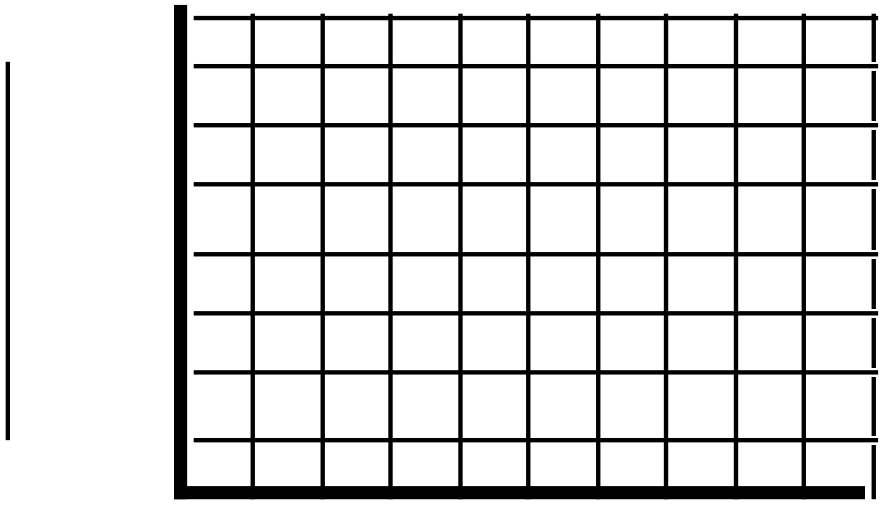
Tally Sheet for Task One

red	
blue	
yellow	
green	
orange	

Spin to Win Bar Graph

Use the given data to construct a bar graph. Be sure your bar graph contains: a title, appropriate labels, and a key if necessary.

TITLE



Four statements I can make about my data are: